CLAIMS

What is claimed is:

1. A force measuring apparatus comprising: a flexible beam having at one end thereof a means for rigid engagement of the beam, and at an opposing end thereof a means for applying a force normal to the beam; mounted in spaced apart longitudinal alignment on each side of the beam, a tensioned wire; a vibratory modulator in electromagnetic communication with the wire, the wire caused to vibrate thereby; and a vibratory sensor in sensory communication with the wire; an electrical circuit functionally enabled for: (i) receiving electrical signals from the vibratory sensor corresponding to a vibratory frequency of each of the wires; (ii) controlling the vibratory modulators to maintain the wires at resonant vibratory frequency; (iii) measuring a differential vibratory frequency between the wires; and (iv) calculating the magnitude of a force applied to the beam in such direction that one of the wires is incrementally further tensioned and the other of the wires is incrementally relaxed.
2. The apparatus of claim 1 wherein the wires contain a magnetic metal component.
3. The apparatus of claim 1 wherein the vibratory modulator is an electromagnetic solenoid.
4. The apparatus of claim 1 wherein the vibratory sensor is a light emitting diode combined with a light modulated junction device, an output signal from the junction device corresponding to the vibratory frequency of the wire.
5. The apparatus of claim 1 wherein, for each of the wires, a driver stage provides feedback of the electrical signals from the vibratory sensor to the vibratory modulator thereby maintaining the vibratory modulator at resonant frequency.
6. A force measuring apparatus comprising: a flexible beam having at one end thereof a means for rigid engagement of the beam, and at an opposing end thereof a means for applying a force normal to the beam; mounted in spaced apart longitudinal alignment on each side of the beam, a tensioned wire; a vibratory modulator in electromagnetic communication with the wire, the wire caused to vibrate thereby; and a vibratory sensor

in sensory communication with the wire; an electrical circuit functionally receiving electrical signals from the vibratory sensors and calculating the magnitude of a force applied to the beam in such direction that one of the wires is incrementally further tensioned and the other of the wires is incrementally relaxed.

7. The apparatus of claim 6 wherein the wires contain a magnetic metal component.

8. The apparatus of claim 6 wherein the vibratory modulator is an electromagnetic solenoid.

9. The apparatus of claim 6 wherein the vibratory sensor is a light emitting diode combined with a light modulated junction device, an output signal from the junction device corresponding to the vibratory frequency of the wire.

10. The apparatus of claim 6 wherein, for each of the wires, a driver stage provides feedback of the electrical signals from the vibratory sensor to the vibratory modulator thereby maintaining the vibratory modulator at resonant frequency.

11. A force measuring method comprising the steps of: applying a force to one end of a flexible beam while holding another end of the beam rigidly; mounting in spaced apart longitudinal alignment on each side of the beam, a tensioned wire in such direction that one of the wires is incrementally further tensioned and the other of the wires is incrementally relaxed when the beam is under strain from the applied force; mounting on each side of the beam, a vibratory modulator in electromagnetic communication with the wire thereby causing the wire to vibrate, and a vibratory sensor in sensory communication with the wire; receiving an electrical signal from the vibratory sensors corresponding to a vibratory frequency of each of the wires; controlling the vibratory modulators to maintain the wires at resonant vibratory frequency; measuring a differential vibratory frequency between the wires; and calculating the magnitude of the force applied to the beam from the differential vibratory frequency.

12. A strain measuring method comprising the steps of: applying a force to one end of a flexible beam while holding another end of the beam rigidly to cause the beam to strain; mounting in spaced apart longitudinal alignment on each side of the beam, a tensioned wire in such direction that one of the wires is incrementally further tensioned and the other of the wires is incrementally relaxed when the beam is under strain from the

applied force; mounting on each side of the beam, a vibratory modulator in electromagnetic communication with the wire thereby causing the wire to vibrate, and a vibratory sensor in sensory communication with the wire; receiving an electrical signal from the vibratory sensors corresponding to a vibratory frequency of each of the wires; controlling the vibratory modulators to maintain the wires at resonant vibratory frequency; measuring a differential vibratory frequency between the wires; and calculating the magnitude of the strain in the beam from the differential vibratory frequency.